Recommended compiler options

Category: Porting to Pleiades

DRAFT

This article is being reviewed for completeness and technical accuracy.

Intel compiler versions 10.0, 10.1, 11.0, 11.1, and 12.0 are available on Pleiades as
modules. Use the 'module avail' command to find available versions. Since NAS does not
set a default version for users on Pleiades, be sure to use the 'module load ...' command to
load the version you want to use.

In addition to the few flags mentioned in the article <u>Recommended Intel Compiler
Debugging Options</u>, here are a few more to keep in mind:

Turn on optimization: *-O3*

If you do not specify an optimization level (*-On, n=0,1,2,3*), the default is *-O2*. If you want
more aggressive optimizations, you can use *-O3*. Note that using *-O3* may not improve
performance for some programs.

Generate optimized code for a processor type: *-xS, -xSSE4.1* or *-xSSE4.2*

Intel version 10.x, 11.x and 12.x compilers provide flags for generating optimized codes
specialized for various instruction sets used in specific processors or microarchitectures.

Processor Type	Intel V10.x	Intel V11.x and above
Harpertown **Nehalem-EP**	-xS	-xSSE4.1
Westmere-EP	N/A	-xSSE4.2

Since the instruction set is upward compatible, an application which is compiled with
-xSSE4.1 can run on either Harpertown or Nehalem-EP or Westmere-EP processors. An
application which is compiled with *-xSSE4.2* can run ONLY on Nehalem-EP and
Westmere-EP processors.

If your goal is to get the best performance out of the Nehalem-EP/Westmere-EP
processors, it is recommended that you do the following:

- Use either Intel 11.x or 12.x compilers as they are designed for Nehalem-EP/Westmere-EP micro-architecture optimizations.

- Use the Nehalem-EP/Westmere-EP processor specific optimization flag *-xSSE4.2*

  ```
  Warning: Running an executable built with the -xSSE4.2 flag on
  the Harpertown processors will result in the following error:
  ```

  Fatal Error: This program was not built to run on the processor in your system. The allowed processors are: Intel(R) processors with SSE4.2 and POPCNT instructions support.

If your goal is to have a portable executable that can run on either Harpertown or Nehalem-EP or Westmere-EP, you can choose one of the following approaches:

- use none of the above flags
- use *-xSSE4.1* (with version 11.x and 12.x compilers)
- use *-O3 -ipo -axSSE4.2,xSSE4.1*(with version 11.x and 12.x compilers).

  This allows a single executable that will run on any of the three Pleiades processor types with suitable optimization to be determined at run time.

Turn inlining on: *-ip* or *-ipo*

Use of *-ip* enables additional interprocedural optimizations for single file compilation. One of these optimizations enables the compiler to perform inline function expansion for calls to functions defined within the current source file.

Use of *-ipo* enables multifile interprocedural (IP) optimizations (between files). When you specify this option, the compiler performs inline function expansion for calls to functions defined in separate files.

Use a specific memory model: *-mcmodel=medium* and *-shared-intel*

Should you get a link time error relating to R_X86_64_PC32, add in the compiler option of *-mcmodel=medium* and the link option of *-shared-intel*. This happens if a common block is > 2gb in size.

Turn off all warning messages: *-w -vec-report0 -opt-report0*

Use of *-w* disables all warnings; *-vec-report0* disables printing of vectorizer diagnostic information; and *-opt-report0* disables printing of optimization reports.

Parallelize your code: *-openmp* or *-parallel*

-openmp handles OMP directives and *-parallel* looks for loops to parallelize.

For more compiler/linker options, read **man ifort, man icc**, or

```
%ifort -help
%icc -help
```